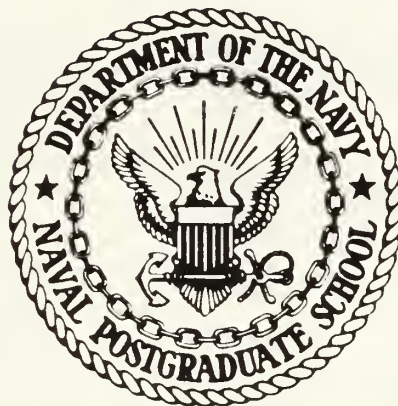


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THESIS

HUMAN ADAPTATION TO THE COMPUTER

by

Frederick Andrew Sycuro

September 1986

Thesis Advisor:

Norman Lyons

Approved for public release; distribution unlimited

T232994

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2a SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited	
2b DECLASSIFICATION/DOWNGRADING SCHEDULE		5 MONITORING ORGANIZATION REPORT NUMBER(S)	
4 PERFORMING ORGANIZATION REPORT NUMBER(S)		7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School	
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School	6b. OFFICE SYMBOL (If applicable) Code 54	7b. ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000	
6c. ADDRESS (City, State, and ZIP Code) Monterey, California 93943-5000		8b. OFFICE SYMBOL (If applicable)	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	10. SOURCE OF FUNDING NUMBERS	
8c. ADDRESS (City, State, and ZIP Code)	PROGRAM ELEMENT NO	PROJECT NO	TASK NO
			WORK UNIT ACCESSION NO
11 TITLE (Include Security Classification) HUMAN ADAPTATION TO THE COMPUTER			
12 PERSONAL AUTHOR(S) Sycuro, Frederick A.			
13a. TYPE OF REPORT Master's Thesis	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 1986 September	15. PAGE COUNT 65
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
		Resistance to Change; Stress; Adaptation to Computers	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) <p>This thesis is a study of the conceptions and fears that man, as both a user and manager, has regarding the computer. A survey of current literature on the subject of man's adaptation and perceptions to the computer has been reviewed in an attempt to identify specific problem areas.</p> <p>This study outlines the more common of these problem areas and provides recommendations for both the user and manager to assist in the adaptation, implementation and usage of the computer.</p>			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Prof. Norman Lyons		22b. TELEPHONE (Include Area Code) (408) 646-2666	22c. OFFICE SYMBOL Code 54LB

Approved for public release; distribution unlimited.

Human Adaptation to the Computer

by

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN INFORMATION SYSTEMS

from the

NAVAL POSTGRADUATE SCHOOL
September 1986

ABSTRACT

This thesis is a study of the conceptions and fears that man, as both a user and manager, has regarding the computer. A survey of current literature on the subject of man's adaptation and perceptions to the computer has been reviewed in an attempt to identify specific problem areas.

This study outlines the more common of these problem areas and provides recommendations for both the user and manager to assist in the adaptation, implementation and usage of the computer.

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ACKNOWLEDGMENT

The author gratefully acknowledges the guidance of Professor Norman R. Lyons, Department of Administrative Sciences of the Naval Postgraduate School. Professor Lyons was instrumental in the clarification of some hazy areas in the contents of this thesis. Special recognition also goes to the author's wife, Virginia, for her encouragement, motivation and toleration of the author's periods of stress. Thanks also go to the author's son, Jesse, for his endless patience while waiting for the author's completion of "just one more page."

I. INTRODUCTION

The age of the computer is here and with it comes a myriad of problems concerning man's interactions with the "machine." Successful implementation of a computer either into a business setting or a household is complicated and complex. The key issue is the need for user involvement. Users are the people who will actually be "hands-on" utilizing the system. They are managers, employees, students, scientists, teachers and housewives.

User involvement, though, is no easy task. As is frequently the case with anything new, there are deep-rooted fears and conceptions. These fears and conceptions must be understood and defined before implementation so that users will accept the new invention and use it.

Computerization, the act of installing and using computers to accomplish some task, is not readily greeted by man. The fears of man are real and can impact severely on the success of the computer system. In numerous cases studies Brod found people who refused to use the new computers introduced into their environment. He found some who resorted to actual sabotage. The sabotage ranged from pouring coffee on the terminal to shooting the computer with a .32 caliber pistol. In another study a manager indicated after one computer installation, "This has been a traumatic

experience--computers scare the hell out of me!" [Ref. 1:p. 35] It was also found in a survey that examined the use of office automation equipment (computers included) that: "Those whose performance was monitored by computers had been absent from work due to illness 50% more than those whose work was not monitored by machines." [Ref. 2:p. 104] In an article in Technology Review in 1983 it was stated that the White House itself didn't even use computers as management tools. No one was willing to risk having valuable information accessible on the computer [Ref. 3:p. 64]. Here their fear prevented the usage of a valuable asset.

Alter also found evidence of this non-acceptance of computers leading to unsuccessful implementation. He found that in 11 out of 15 systems, significant implementation problems occurred when users neither initiated nor played an active role in the planning process. [Ref. 4:p. 103]

Given that management desires their computer system to be successful, they must understand the causes of user fears and conceptions and then do what they can to alleviate them.

This thesis examines the conceptions and fears of computer uses with a slant towards the management area. The goal of this examination is to define the causes of these fears and conceptions and to provide recommended steps that man and management can take so that a smoother, more adaptable transition to computer usage and implementation can be accomplished.

A. OBJECTIVE

The concept of computer usage by non-technical personnel will be explored, along with the attitudes and feelings of those personnel as they relate to the computer. User and manager concerns will be addressed in this study as the method of relating their reactions in a business framework.

The objective is to provide the reader with sufficient data on which to draw informed conclusions concerning the fears and conceptions of non-technical users as they are forced, coerced or led into computer system usage. The scope of this study will allow some background information and organizational impact to be discussed. It will also clarify some of the psychological problems associated with user reactions and fears.

The major conclusion is that in the past too much attention has been focused on the computer's performance rather than on the user's reactions and attitudes. As Alter points out,

. . . the general problem here is a common tendency for technical people to concentrate on the "technical beauty" of a system or idea and to assume that non-technical people will somehow see the light . . . [Ref. 4:p. 102]

Early systems development was technically oriented and ignored human factors [Ref. 1:p. 8]. Most of the early computers were one of a kind shrouded in a mist of technical novelty. "The wider 'people' considerations were often less important, or at least less apparent." [Ref. 5:p. 50]

Human considerations were not part of the process as noted in this 1975 article,

. . . computer manufacturers have not devoted resources to researching the human factors on the computer systems leased, and sold to customers. Millions of dollars are allocated to research and development of computer technology, and massive industry efforts are devoted to solving technical challenges . . . (but this) neglect of human factors remains one of the fissures in the foundation of the computer industry. [Ref. 1:p. 10]

Society must keep perspective and maintain a view of man as its most important asset. The computer and all its associated equipment is a tool for man, not vice versa. Man must not become a slave to the machine.

This study, accordingly, was motivated not only by an interest in the impact of computers on the past but a genuine concern for their impact on the future. Successful implementation of computer systems is the goal of all management personnel and therefore an understanding of problem areas is of paramount interest.

The objectives of this thesis are outlined below:

1. To identify user fears and conceptions concerning the use of computers.
2. To identify manager fears and conceptions concerning the use of computers.
3. To describe briefly the psychological problems associated with user reactions to the age of computers.
4. To propose recommendations that will:
 - a. allow management to successfully implement computer systems smoothly and efficiently.
 - b. allow man to adapt to the computer in a manner where he maintains his position as the master, not the slave.

B. RESEARCH QUESTIONS

1. What are the reactions of humans to the use of the computer? Are they overjoyed or fearful? How has the computer affected them, their lifestyle, their outlook?

2. What methodology should be used by management to make man's adaptation as smooth and painless as possible and yet achieve success?

C. APPROACH

The investigation documented here is intended to act as an educational tool to provide knowledge and experience to management and man in the area of computer adaptation. The project will investigate fears and conceptions of users and managers concerning computer usage and provide management with recommendations to implement before computer systems' introduction and for dealing with users after installation.

Primary sources are the contemporary literature. Secondary sources are personal interviews with various personnel, both management and employee types associated with computer usage.

Chapter II will present a general background of computer technology and plausible explanations for the current concern for man's adaptation to computer technology.

Chapter III will present the more frequent user fears and conceptions concerning computers.

Chapter IV will present the more frequent management conceptions and fears concerning computers.

Chapter V will address some of the potential psychological problems associated with computer usage.

Chapter VI will include recommendations for successful computer implementation procedures in regard to management and users.

Chapter VII will be the conclusions.

II. BACKGROUND

The stage for the invention of the computer was set in the 1600's when Gottfried Wilhelm von Leibniz wrote the following, "It is unworthy of men to lose hours like slaves in the labor of calculation." Man has fully realized this. He continues to seek and discover new and better ways to perform his bidding and release him from that "slavery."

Just as the Industrial Revolution upset the world schema, the Computer Revolution was, and is, reshaping the world. Computer technology is advancing in leaps and bounds and the limits are nowhere in sight.

Computers are being used everywhere. Almost every office has one and many households have one. They are being used for many applications in the fields of finance, office, education, administration, science, and business management. As tools their most important assets are their speed and accuracy. They are fast and efficient, provided they receive valid inputs. The drop in price of computers has made them accessible to nearly every business and home.

Newspapers, magazines and newly published books flood the market with information concerning the computer and its associated equipment. Man is being inundated. The early concerns in computer technology were not focused for such a widespread audience. The computer designers of the 50's and

60's were concerned with the technical aspect of computers. They were not concerned with the end-user's perceptions and fears. The symbiotic relationship that could exist between man and the computer has not developed. Instead, what has developed is a "modern disease of adaptation" called "technostress," a phrase coined by Brod.

Craig Brod, noted psychotherapist, has defined "technostress" as man's inability to adapt to the computer in a healthy manner [Ref. 3:p. 16]. The result of this failure to adapt causes reactions in man ranging from slight anxiety to extreme fear.

These negative reactions have caused feelings of inadequacy and intense hatred towards computers and everything associated with them [Ref. 1:p. 7]. These negative feelings and management's ignorance of them has resulted in many system failures [Ref. 5:p. 50]. In Information Systems Concepts for Management, Lucas found many systems had failed because the reactions of users were ignored [Ref. 6:p. 4]. Brod also discovered, in numerous personal interviews, that many users resort to outright sabotage due to both their own failure to adapt and the failure of management to consider human factors. In studies by Fahey, Love and Ross, it was discovered that the success or failure of the system ". . . is often a result of failing to adapt the MIS (Management Information System) to the people who will use it." [Ref. 6:p. 51] Again it must be emphasized that a computer system

can only be considered successful if it is used by man [Ref. 6:p. 7]. As stated by Keen and Morton,

. . . it is essential to consider human aspects very carefully, both in terms of the effect of computerization on the work force and on the nature of the work and of the process by which large scale systems are introduced into the organization. [Ref. 5:p. 50]

Humans need time to adjust to changes in their environment and, if not given time, their resentment increases. The less man understands the new technology, the greater his bewilderment and the greater his bewilderment, the greater his resistance will be [Ref. 7:p. 539]. Overcoming man's resistance to change is a major issue that will be addressed in later chapters as this is a keystone to man's successful adaptation to computers.

There are few people today who would deny the effects the computer is having on society. Management must reevaluate its practices and objectives, and devise new solutions and attitudes to attract, motivate and hold its employees. The human factors must be considered and carefully planned changes incorporated if a computer system is to be successful. Without consideration of the human factors, the effectiveness of computer systems is greatly diminished. If users don't use the computer for whatever their reason, if they sabotage it, or if they react to it in a negative way, the cost in manpower and equipment cannot be justified. People are the primary input of any organization and as such their management is and should be the primary focus of the

organization. "To sustain itself an organization must acquire and manage people." [Ref. 8:p. 10]

The management of man, to be productive and satisfied, is the key to success for any organization. This task, though, is no easy accomplishment because of the rapid technological changes the manager is facing today. This thesis will define the user's fears and conceptions of computers uncovering the areas that man must understand if he is to successfully control the computer and its social and psychological ramifications. The future holds much for man and the computer can assist his attainments, but only if he maintains a humanistic approach toward it [Ref. 3:p. 224].

III. USER CONCEPTIONS

Computers have been described as the most significant advance in man's civilization [Ref. 3:p. 4]. This advance has caused dramatic changes in man's way of life. It has caused several emotions in man that have made him cautious and leery.

Man is by nature homeostatic, that is, he tries to maintain his life in balance. Changes are disruptive to that balance and as such are not accepted willingly. The changes, brought on man's environment by the computer, have set the wheels in motion for dramatic actions and concerns with regard to the computer.

Of these concerns there are several basic ones that will be addressed here. The identification of these concerns should help man in his quest for advancement and healthful adaptation to the computer.

Within this chapter the user's fear of job loss, VDT (visual display terminal) physical damage, fear of the unknown and fear of being dehumanized will be discussed and analyzed.

A. JOB SECURITY

At the top of man's fears is the fear of job loss [Ref. 9:p. 3]. Automation has frequently brought layoffs and with the computer's publicity as a means to reduce the work

force, employees have no alternative but to see themselves as expendable [Ref. 2:p. 106]. The reputation of computers as replacements for people is sometimes a reality and as such they are viewed as a definite threat to man's job security.

Older workers fear that they will not be able to adapt to computers and learn the new methodology [Ref. 9:p. 3]. Part of this conception is due to the confusing terminology and language that has been used by the computer industry. The guarding of computers ". . . by a high priesthood who used a strange vocabulary and made the laity fearful of asking questions" [Ref. 5:p. 57] has kept the common worker in the dark. To the uninitiated old-timer, "computerese" is a second language that he sees as an insurmountable obstacle in his attempt to adapt.

As man works at his job he uses his mind and body in three different ways [Ref. 10:p. 450]. He uses skill (manual dexterity and strength), personal control (based on the 5 perceptive skills), and brain power (memory and decision making ability). According to Dorf, the computer seems to be rapidly taking over all these functions. To many it is only a matter of time before the computer replaces them [Ref. 3:p. 56]. It is even predicted that by 1988 factory equipment will be 90% computer-controlled and only 50% of the unskilled workforce will remain [Ref. 3:p. 56]. Although no one can predict the future accurately, there is

bound to be some unemployment due to computerization. Man can see the "writing on the wall."

Professional workers (engineers and scientists) are also in a quandry due to the rapidity of the changes in computer technology. Obsolescence can occur quickly in an industry where innovations occur almost overnight. As stated in 1872 by Samuel Butler in The Book of Machines, "I fear none of the existing machines; what I fear is the extraordinary rapidity with which they are becoming something very different to what they are at present." [Ref. 7:p. 375]

This thought was echoed by Norbert Wiener in 1960 who wrote, "As machines learn they may develop unforeseen strategies at rates that baffle their programmers." [Ref. 10:p. 435]

In the past thirty years the improvements in technology have increased the speed of computation by a factor of 250,000 [Ref. 10:p. 424]. It is no wonder obsolescence is a serious threat. Those who do not keep up with the changes will become incompetent and their loss of skill will result in their unemployment.

The fear of job loss and the actual occurrence of unemployment can have a crippling effect on the individual and society. It is a cause for resistance to change, resistance to the new computer technologies.

B. VDT DAMAGE

Users are concerned and fear the possible effects on them physically and mentally from the prolonged use of VDTs

(visual display terminals). Even though all current data states that no harmful radiation from VDTs has been detected, it is still a concern of many users [Ref. 3:p. 33].

The U.S. National Institute for Occupational Safety and Health (NIOSH) considers the use of terminals by clerical workers one of the most stressful occupations in modern society [Ref. 9:p. 11]. This stress is caused in large part by the physical environment. Constant repetitive data entry and gazing at the terminal can cause several physical symptoms that cause user stress.

In a poll at Verbatim Corporation in 1982, of 1263 office workers, 63% were concerned with eye strain, 36% were concerned with backstrain and 79% requested periodic rest breaks [Ref. 3:p. 31]. This concern is real and since users have these feelings, management should be motivated to take corrective action.

Another concern is the "McCollough Effect." This occurs as a harmless physical effect that causes the user's color perception of characters to change after prolonged gazing at his terminal. Although no noted physical damage occurs, users have mentally associated this phenomenon as a failure on their part to adapt to computer usage and concern that perhaps it is causing physical damage. [Ref. 3:p. 31]

Physical fatigue is a reality with prolonged usage of the computer terminal. Users have experienced headaches,

weariness, neck pains and burning eyes. VDT character size, readability, brightness and picture quality are all key causes of fatigue [Ref. 3:p. 32].

Concerning a study conducted by the National Research Council, Dr. Lawrence Stark, a neuro-ophthalmologist at Berkeley, stated that, "Just because visual fatigue is not scientifically well-defined does not negate the fact that there is fatigue." [Ref. 3:p. 33] In Boston in 1983 the "VDT Risks Hotline" recorded about one-hundred calls a day from users reporting VDT physical problems [Ref. 3:p. 34].

The conclusion to be drawn from this information is that users are experiencing problems with VDT usage. These problems should be considered by management when they implement and use computer systems. Fatigue, whether mental or physical, can be destructive to any organization if not combatted and dealt with effectively.

C. FEAR OF THE UNKNOWN

Man, though an animal much suited for adaptation, does not like or happily embrace changes to his environment. He likes what is familiar to him and has a strong dislike for the unfamiliar. Therefore it should not be any surprise that man dislikes the unfamiliar environment of the computer.

As Tomeski observed,

To a large number of people; the computer remains a mysterious and threatening device. The computer is viewed as a composite of demonic and godly characteristics and

capabilities as can be seen from the generic terms used in referring to the computer: the giant brain, the monster, the robot, the black box, and some unprintable adjectives. [Ref. 1:p. 30]

Users sometimes resent the computer for its lack of response and the inability on their (the users) part to understand how to make it work. Resentment builds for users especially when they are abused by discourteous software messages while trying to learn the new code [Ref. 2:p. 106]. Every software package seems to have its own idiosyncracies that make learning it difficult and "non-user friendly." Messages such as: "fatal error, run aborted," "does not compute," or better yet just a blank screen after user keyboard action, yields first fear, then anger and resentment.

Man has a need to feel self-confident, but as the computer system is introduced, this self-confidence is shaken by the accompanying lack of knowledge and experience with the new technology. The new system is strange and there is a real fear that the user will not be able to understand it [Ref. 11:p. 283]. This lack of understanding has been nurtured by data processing personnel and computer companies. Users are subject to systems that data processing personnel have created and,

Like any other profession, they have created their own language which has excluded outsiders from their conversations. They have applied a mystique to the computer in the eyes of the user, and they seem to be unable to describe their own product so as to make their service understandable to the man they expect to use it and pay for it. [Ref. 11:p. 89]

In The Computer Survival Book, Woolridge and London wrote: "Half the battle of understanding computers--and more important, the computer people--is to understand the jargon.", [Ref. 1:p. 30]

In Alter's research in 1974, he discovered that all too often technical people have had a tendency to emphasize the "technical beauty" of a system and have assumed that the non-technical person will miraculously see their way through it. "This sort of over-optimism was present in the history of almost every unsuccessful system in the sample." [Ref. 4:p. 103]

New systems and languages are difficult to learn and the computer industry has not done well in providing the tools to make man's adaptation easy. The "on-line help" facilities of software packages have been sorely lacking in true help and users become frustrated and confused by the unknown in front of them. User manuals have not been much better, in fact; "The introductory book for the IBM personal computer is so confusing that a guide for the guide had to be published." [Ref. 3:p. 12]

The concept presented to users is that computers are "user-friendly," yet man is continuously finding them "unfriendly." As an invention that is supposed to make work and living easier and better, man is frustrated even more when he discovers that the computer "is down." The user though is kept in the dark and is left to wonder why the

computer is down. The technical wizards maintain their aloofness and refuse to tell the user why, as they believe he could not understand their explanation anyway. But as noted in study after study, "An oft-cited contributing factor to implementation failure is the assumption by system designers that users need not understand how the system works, only how to use it." [Ref. 12:p. 23] If this attitude prevails, users will continue to fear the unknown powers of the computer.

Placed abruptly in that setting, and reassured that the computer is merely a new (and easily digestible) addition to office equipment, most of us end up feeling incompetent, ill at ease, blaming ourselves for our lack of adaptability to systems that are actually difficult to comprehend. [Ref. 3:p. 12]

Commonly, man has a fear of the unknown and if the computer industry and management do not adjust their approach to users, user "resistance to change" could result with negative effects on the organizations involved and society. This "resistance to change" will be discussed more in depth in later chapters.

D. FEAR OF DEHUMANIZATION

Many modern day users are concerned over the dehumanizing effect that the computer will have and is having on humanity. Dehumanization, as defined by the American Heritage Dictionary, is the act of depriving of human qualities or attributes and the rendering of mechanical or routine.

Users are concerned that the constant daily workings with their terminals without human interactions is causing a degradation and a loss of their humanness. Dr. Michael Yapko, clinical psychologist and director of the Milton Erikson Institute in San Diego, stated that "As technology advances the emphasis is on being able to do things independently." [Ref. 13:p. 4D] The demands of computer work don't allow room for personal interactions. "There is less and less opportunity for people to talk, interact and learn about the range of feelings, needs and motivations." [Ref. 13:p. 4D] Gradually as the user becomes more and more absorbed in his work he loses sight of reality and loses his ability to relate to non-computer objects. Users are concerned over this growing alienation and do object to it as noted in studies by Mumford and Ward, where long term relationships and social ties are being severely disrupted by the new computer system's forced "isolation" [Ref. 1:p. 34].

The overidentification with the new computer technology is defined by Brod as "technocentered," a form of "techno-stress" [Ref. 3:p. 17]. Users become so involved in their symbiosis with the computer that they lose sight of all else. The obsession with making their program run or completing their work project can create within them a loss of human feeling and emotion.

There have been a lot of jokes made about the number of marriages that go on the rocks because people would rather

sit in front of a computer terminal than spend time with their spouse . . . people are having substitute relationships with . . . their computers. [Ref. 13:p. 4D]

The problem that occurs is frequently obscured from the user and he or she is totally unaware of the transformation that has occurred.

In an age of enlightened awareness, man is becoming more alert to this phenomenon and his concern is rising. It was noted in one study that users felt very strongly towards opposing the modification of their personal behaviors in meeting computer demands, and they responded in one of three ways: 1) they refused to use the computer at all, 2) they only used it for a limited period of time, or 3) they use a go-between to interact for them [Ref. 1:p. 19].

These behaviors are not indications of successful adaptation. They are, however, indications of man's need to have a better perspective and view of the computer if he is to successfully use it to its full potential.

IV. MANAGEMENT CONCEPTIONS

Management, whose job is to guide the organization through the environment, in a safe, efficient and effective manner, has had to make drastic adaptations to the changes brought on by computers. The changes have involved all levels of management from senior executives down to mid-level line supervisors.

The changes involved in adapting to the technology have not come without resistance and fear from the managers involved. Management is instrumental to organizational change. It is therefore necessary to understand their fears and conceptions to better devise implementation strategies that can be "sold" to all levels of the organization.

Some of the fears of management are not dissimilar to those covered in the previous chapter. Most frequent and of primary concern are the following: fear of job loss, fear of power loss, fear of obsolescence and conception of computer being all-powerful. This chapter will clarify these fears and conceptions in the hope that with a better understanding, man, in his role as manager, can learn to facilitate a smooth transition during computer system implementation and usage.

A. FEAR OF JOB LOSS

In a similar manner, managers of organizations at all levels fear for their jobs just as much as user employees. They too, feel the threat that they will be replaced by computers. A prevalent line of thought in the 60's was in fact to replace all middle management with computers [Ref. 14:p. 11].

Managers have seen their positions severely threatened by machines that now do jobs at the touch of a button that previously took years of training and experience [Ref. 15:p. 37]. Today's computerized systems have bypassed the need for the midlevel manager's expertise and given the top level manager's access to that information in a faster, more efficient manner [Ref. 16:p. 60]. Likewise many job functions are being eliminated and when the job goes so does the manager [Ref. 9:p. 3]. The middle manager inevitably sees his job security threatened.

The rise of the "whiz kids," who know how to operate the new technology, has created a panic among old order managers who in previous years felt that wisdom and confidence only came from years of practice [Ref. 2:p. 104].

Also causing this fear is the rapid dissemination of information that has occurred from the new technologies. Previously a manager could discover a problem, analyze it, and fix it, long before his superior saw the results. Today, however, the speed of the technology allows upper

management to see the problems overnight and when they do, they (upper management) want answers, and quickly. Mid-level managers are caught scrambling and are frequently the "scape-goat." Often they are fired and replaced without even a second thought.

Yet, even though managers in general can understand the unemployment threat better than employees, they are still subject to much stress concerning their own job security [Ref. 3:p. 57]. Managers face the computer age with much anxiety and their self-confidence factor has been severely shaken as they embark on their adaptation to computers.

B. FEAR OF POWER LOSS.

A significant fear and reality for management is the subsequent loss of control and responsibility that comes with computer system implementation [Ref. 17:p. 34]. "The total system approach demands the sharing of data that may have previously been under the manager's control and influence." [Ref. 17:p. 34]

The manager's basic self-confidence and esteem are shaken at their very roots as he is forced to turn over his "guarded" information. Argyris points out that,

. . . an effective MIS (Management Information System) will ask the executives to produce precisely that information that they may have learned to withhold (until the appropriate moment) in order to survive. [Ref. 1:p. 22]

Managers balk at this turnover and resist it. They have no desire to lose the control they once had.

The ego is an important consideration and man resents anything that threatens to lower it. Executives feel a loss of decision making capability and feel they are being judged on their ability to use a machine and not by their ability to manage [Ref. 2:p. 104]. The computer's massive memory and virtually infallible logic make it the center of attention and power. The manager's previous "seat of the pants" and "gut feeling" managerial styles are no longer needed, making the manager feel that he is inadequate.

The results of these feelings can drive the manager to fight or flight. Managers either leave the organization or resist it by holding back information. As a manager's span of control is reduced, they see themselves slipping on the corporate ladder and self-doubt and stress levels rise unencumbered [Ref. 3:p. 63].

Managers resort to gamesmanship in order to maintain their positions of control and power. They play what Brod refers to as the games of "star," "ransom," and "maintenance" [Ref. 3:p. 69].

In the "star" game, the executive tries to maintain the spotlight by bringing in the newest progressive equipment to the company. He may not even know the capabilities of the old equipment. To his superiors, though, he appears to be innovative and modern. He effectively uses the new technology to stay visible, yet frequently at the expense of the whole organization literally.

In the "random" game, the manager slows down his inputs, he withholds the needed information so that an effective decision cannot be made without him. He thereby maintains a lever of power and control that prevents the organization from moving ahead.

In the "maintenance" game, quite similar to the "random" game, the manager effects changes to the hardware or software program, but only documents them for him or herself. Subsequently, when the system has a flaw, only that manager has the ability to correct it. He has succeeded in making himself vital to the organization and maintained his control.

Any person in a management position, generally, has reached that position through hard work, experience and education. Their self-image is vital to their continued strong performance. Any challenge to that self-image is viewed negatively.

To many a senior administrator, the introduction of computers to his firm has been a greater blow to his pride than to his pocket, and in extreme cases has resulted in sabotage. [Ref. 7:p. 426]

The stripping away of that self-image and the ensuing resentment of the computer system, that appears to have caused it, must be dealt with if organizations are to successfully adapt to computers.

C. FEAR OF OBSOLESCENCE

With the rapidity that computer technology is advancing, management personnel have a valid fear concerning their ability to keep up with the changes. Many managers feel that as the technology changes they are being left behind with nothing better done to bring them up to date [Ref. 2:p. 104]. In a recent survey by Computerworld, 68.5% of the data processing and MIS managers felt an increase in stress due to the need to keep up with the new technology [Ref. 18:p. 56].

Computer literacy has become a major organizational concern. Managers feel stressed over how much they should know, and advertisements by the computer industry are not helping. The push and inference that if you don't own a computer you are not with the times is ridiculous, yet it is a reality of the 80's. The constant evolution of new products in the field is overwhelming and as managers seek to keep up they are giving up "leisure" time and possibly even spending their own money on a computer. This nurtures the growing resentment [Ref. 2:p. 106].

The close linkage of computers to success and advancement in the future has all but mandated today's managers to stay current and develop their computer skills or standdown and remain fossils [Ref. 3:p. 89]. If they do not keep up with the advances they can become incompetent quickly and totally obsolete, especially in the wake of the strides in

education of the younger generation in computer technology. "Being computer-literate today will not guarantee you a more interesting or secure job--it may not provide you with a job at all.", [Ref. 3:p. 5]

The fear of obsolescence, in view of the unknown advances of technology, can be demoralizing, depressing, and nerve wracking to the manager of the 80's. The associated stress must be addressed and controlled if management is to proceed with confidence and competence in the adaptation to the computer.

D. CONCEPTION OF ALL POWERFUL

Management, thanks to the media, has received the impression that the computer is an all powerful invention that can solve all his problems. This conception has led to much dissatisfaction, disillusionment, and frustration for management. Much disappointment with the actual ability, when contrasted with the commercial vendor's promises, has contributed much stress in management personnel [Ref. 2:p. 106]. Advertising hype ". . . has created a lot of cognitive dissonance between what higher management believes and what is real." [Ref. 2:p. 108]

All too frequently the computer system is advertised as a money saver but in reality it ends up becoming a costly adventure. Managers expect the computer to be their salvation and when it does not occur, ". . . expectation conflicts with reality and stress spirals and cooperation and

productivity plunge." [Ref. 2:p. 108] Computers touted by the industry as the key to efficiency, effortlessness and speed, have convinced management that they are vital to him and without which he cannot possibly function. Yet, when purchased and installed, all too frequently the manager has found his system lacking in capability and severely limited in its applications.

Not all can be blamed on the vendor's though. Man by his nature frequently allows his expectations to be driven by his desires [Ref. 11:p. 48]. System designers in their enthusiasm embellish the system and managers jump at it. Over-anticipation by management also abounds as a source of expectation failure. Managers, who view the computer as a cure-all, "a bionic Moses," that will lead them to a promised land where all problems are solved, are sadly frustrated and disappointed [Ref. 11:p. 48].

The result of the over-expectations is in Brod's terms another form of "technostress." Managers (according to Brod) have been implementing computers in ways that contribute directly to this stress: [Ref. 3:p. 38]

1. They think that computers can solve problems that are at their core personnel issues; labor tension, poor morale or falling productivity.
2. They assume that all employees are capable of learning the technology at the same rate.
3. They keep workloads high while people attempt to master new tasks and procedures.
4. They introduce computers with little or no motive or preparation.

5. They hover over employees during the introductory period all too frequently pointing out only their mistakes.
6. They keep policies regarding retraining or layoffs secret thus fueling rumors.
7. They scold employees for using older, informal networks for information gathering.
8. They delegate the entire responsibility for implementing the new computer system to lower level managers.
9. They don't invite employees to participate in deciding how the new system will be used. Instead, they stick closely to corporate directives.
10. They reduce funds for training personnel to an absolute minimum.

The result of the above implementation methods is an organization that cannot meet its goals. The managers expect too much and as goals are not met, production is not maximized. Management at all levels becomes irritated, hostile and disappointed.

The need is clearly here for an honest perspective by management and the computer industry. The computer is a tool with limitations and unless they are recognized before implementation, management will face serious organizational "people problems."

V. PSYCHOLOGICAL PROBLEMS

As mentioned previously one of the major psychological impacts of computers has been the development of a new disease called "technostress." This expression coined by Craig Brod, a noted psychotherapist, is the failure of man to successfully adapt to computer age technology.

The results of this failure are, and can be, highly destructive to man and his environment. He can either become technocentered, where the only important thing in his life is the computer and its peripherals, or he can become technology stressed, where everyday is a vicious struggle to adapt to the new technology.

The roots of this stress are founded in the fundamental hierarchy of needs developed by Maslow. In this hierarchy man's need for self-esteem and security are primal forces, capable of motivating him to action. The changes presented by the computer and its technology inevitably ". . . may alter the way in which we relate to and feel about what we are doing." [Ref. 19:p. 62] The influence of these changes focuses on man's basic self concepts. Computers have posed a threat to these concepts and man's security and self-esteem are in jeopardy.

Basic psychology suggests that when man is threatened he resorts to a "fight or flight" reaction. This reaction,

anxiety producing in itself, is man's attempt to overcome the current stress whether it be externally or internally imposed. Stress, then, is the area that man must understand if he is to successfully adapt to computer technology.

A. STRESS (DEFINED)

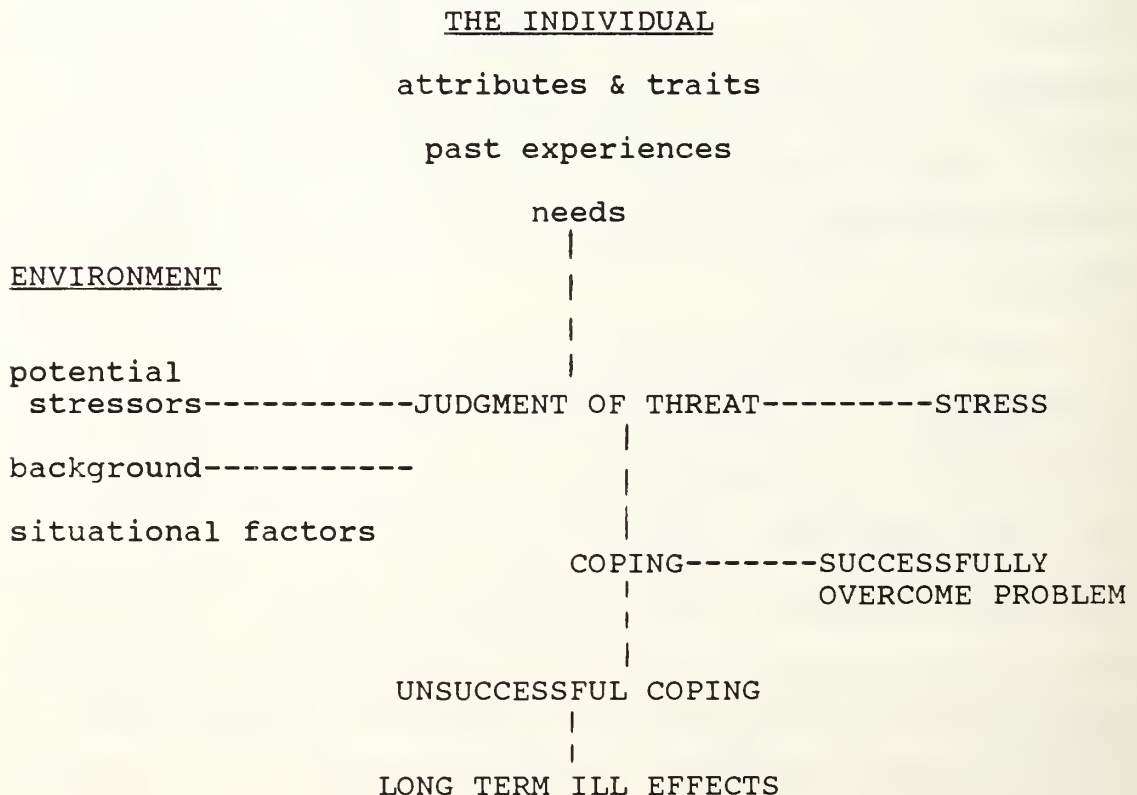
Stress as defined by the American Heritage Dictionary, is ". . . a mentally or emotionally disruptive or disquieting influence." Hans Selye (M.D., Ph.D.) defined stress as ". . . the nonspecific response of the body to any demand upon it." [Ref. 20:p. 20] Coffer and Appley defined stress as ". . . the state of an organism where perceived that his well being (or integrity) is endangered and that he must divert all his energies to its protection." [Ref. 21:p. 8] Stress, then, is a natural response of the organism to the internal and external processes which reaches those threshold levels that strain its physical and psychological integrative capacities close to or beyond its limits [Ref. 21:p. 8].

Man's reaction to stress depends upon his perception of the harmful or threatening event. Man's perception ". . . is the vital link between the individual's environment and his experience of stress." [Ref. 21:p. 8] In his attempt to adapt to stress, man is seeking to return to the equilibrium point of balance that existed before the presence of stress.

Selye theorized that man's reaction to stress followed his General Adaption Syndrome Model. This theory states that man's reaction is a three-fold process:

1. An alarm phase; body and mind are alerted by a stressful event which triggers man's defense mechanisms.
2. A resistance phase; the body and mind fight against the stressor trying to maintain or return to an equilibrium point. But if unsuccessful the third phase kicks in.
3. The exhaustion phase; body and mind give up the fight, unable to resist any further. The defense mechanism fails and subsequent physical and behavioral problems develop.

This theory was backed up by Cooper, who gave us the following Person-Environment Model of Stress to help understand the process:



As pointed out by Selye, man has a set limited supply of adaptive energy which is utilized to successfully cope with stress. His theory maintains that this energy can be used up if man faces an overdose of stress with highly destructive results; physically, mentally and psychologically. This overdose of stress causes anxiety which, in relation to computers, can be expressed as irritability, headaches, resistance to learning about them, and outright rejection of the technology [Ref. 3:p. 16].

Man lives in a constant world of change. Changes in his world occur frequently and they cause some level of stress. Stress is vital to man. It is a motivator for action. The lack of stress can cause complacency and boredom.

Stress can be a "positive" (good) force for man or a "negative" (bad) force. As a positive force it is beneficial and creative, possibly even required to promote innovation and stimulate responses [Ref. 22:p. 38]. There have even been some recent medical studies that indicate that stress causes the release of chemicals in the body that prevent diseases and promote a sense of well being [Ref. 3:p. 21].

As a negative force it is detrimental and destructive to man. It can cause physical, psychological, and behavioral problems. Stress has been identified as the major cause of psychosomatic illnesses leading to high blood pressure,

ulcers, headaches, heart disease, and cancer [Ref. 23:p. 88].

In his article, "Stress the Enemy Within," Tom Slear wrote that stress is considered to be either acute (episodic) or chronic (day to day) [Ref. 24:p. 21]. Acute stress is caused by high levels of stressful events that are disruptive and require high expenditures of adaptive energy to cope. These are one time occurrences such as; death of a close family member, losing one's job, or buying a house. Chronic stress is stressful events that occur on a day to day basis that require utilization of low levels of our adaptive energy such as; driving to work on a crowded freeway, or having to work with someone we dislike. Both forms can be serious as they drain off adaptive energy to cope. Chronic is perhaps more serious as it is subtle and gradually builds up. Its causes are frequently hard to identify, whereas in acute the cause is obvious.

Stress is further defined as either being internal or external. Internal is what we create ourselves. It is caused by fears of mistakes, unrealistic expectations, unachievable goal-setting, worry over failure and self-consciousness. Internal stress since created from within can be controlled and eliminated with proper self adjustments. External stress is caused by factors over which we have no control. It is caused by difficult work assignments, employers, teachers and any sources that are outside

influences on our life style. No matter which source applies, when the level exceeds our capability to cope and adapt, performance level will drop off significantly and new problems arise.

Brod described the adaptation process to stress as being either a matter of simplex or complex. Simplex leaves the composition of self unchanged and is merely an adoption of a new way of doing things. With simplex adaptation, man's personality, his outlook on life and his social relationships remain unchanged. In complex adaptation, man's "sense of self" is altered and his manner of thinking and feeling about the world is modified. Complex adaptation is stressful and when pushed beyond his limits the results are harmful, leading to anxiety, depression, low self-esteem and irritability. [Ref. 3:p. 22]

Adaption to computers is a complex process considering the drastic changes that occur in lifestyle, relationships and routines. "The resulting tension not only changes personality and behavior, but pushes us beyond the threshold of manageable stress." [Ref. 3:p. 22] Moss has referred to the demands that cause stress as "management stressors" and when viewed in relation to the computer field can be interpreted as "stressors" to everyone involved. He has defined them as,

Any objective conditions or changes in the work environment that are perceived as potentially harmful, threatening, frustrating or challenging; or any set of

circumstances related to work that require change in one's ongoing life patterns. [Ref. 22:p. 38]

The identification of these "stressors" should assist man in his adaptation and enable him to better plan for computer implementation and usage.

B. CAUSES OF STRESS

Anxiety producing events, "stressors," are numerous but concentrating on those associated with users and managers of computer systems, the following seem to dominate today's literature:

1. depersonalized management
2. lack of planning and communication before implementation
3. lack of user input in selection and design of system
4. fear of job loss
5. constant and unrealistic deadlines
6. lack of training before implementation
7. lack of "friendly" documentation
8. high visibility of mistakes, narrow margin for error
9. varied task quality (repetitive, boring work not requiring human interaction)
10. loss of opportunity to take pride in work, product quality sacrificed for speed
11. long irregular work hours
12. lack of career path identification
13. frequent job changes
14. growing work backlog
15. disappointment with "actual" computer capabilities

16. resentment due to being treated as a lower being than the computer (depersonalization)
17. resentment for degrading, discourteous error messages
18. loss of individuality
19. loss of decision making power
20. lack of in-house support to answer questions and solve problems with use of new system
21. overload of data produced, not enough time to review
22. need to keep updated with a constantly changing technology
23. fear of not being able to adapt and learn new technology (job impoverishment)
24. resentment at having to spend personal income and time on machine to learn at home
25. frequent peaks and valleys in workload
26. monotonous work
27. mismatch of job skills with job requirements
28. inability to take breaks in work process even for short periods of time
29. great demand for problem-solving techniques
30. poor work environment
31. fear of radiation hazard from video display terminals
32. ineffective, poor management and organization structure
33. inequities in rewards and promotions

The causes are clearly quite extensive. The whole gamut of the organization is caught in the phenomenon. Users, DP personnel, systems analysts, system designers, middle class managers, and upper management personnel are all subject to

these stressors, each at varying levels and in varying amounts.

This is not to say that the stressors mentioned above are solely due to the new computer technology, but they are closely linked to that technology, and whether real or imagined they are genuine "people concerns." The results of "people concerns" can be summed up as overstress.

Oversstress can cause a variety of effects physically, psychologically, and behaviorally. Physically stress can cause high blood pressure, ulcers, heart disease, cancer and headaches. Psychologically stress can cause depression, negative self-image, mental breakdown and paranoia. Behaviorally stress can cause loss of drive, loss of initiative and lethargy. The effects of all the above on an organization are declines in productivity, morale, work quality, motivation, and increases in absenteeism, personnel conflicts, turnover, mistakes and accidents. If unmanaged these problems can bring the organization on the whole into a state of being neurotic, psychotic, and sociopathic, eventually leading to its demise.

C. RECOGNIZING OVERSTRESS SYMPTOMS

Reactions to overstress can be defined as either active or passive behavior [Ref. 22:p. 39]. According to Burton the active behaviors are:

1. risktaking
2. aggression

3. violence
4. antisocial activity
5. grievances
6. work slowdowns/missed deadlines
7. strikes
8. absenteeism
9. tardiness
10. turnover
11. reluctance to assume certain assignments
12. increased tobacco consumption
13. increased alcohol/drug consumption.

He further defined the passive behaviors as:

1. resignation
2. low motivation
3. indifference to quality
4. indifference to productivity
5. lower life satisfaction
6. lower political and cultural activity.

Also cited by Cooper [Ref. 21:p. 13] are the following symptoms:

1. difficulty in thinking rationally and seeing all aspects of a problem
2. prejudicial judgments, rigid views
3. out of place aggression and irritability
4. withdrawal from relationships
5. inability to relax.

Management can recognize all of the above symptoms and with specified corrective actions can relieve them and the stress that has brought them on. Technostress ". . . is the Black Plague of the 20th Century." [Ref. 21:p. 12] Management cannot ignore it if man is to survive the computer age successfully and harness the powers of the new technology.

VI. RECOMMENDATIONS

There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all who profit by the older order, and only lukewarm defenders in all those who would profit by the new order. This lukewarmness arises partly from fear of their adversaries, who have the law in their favor; and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it. (Machiavelli, The Prince, 1513)

Realized in 1513 by Machiavelli, overcoming resistance to change is by far the driving factor for success in man's adaptation to the computer. To reemphasize points made earlier: computers represent major changes to man's environment, "Change is strange, threatening and full of uncertainties." [Ref. 11:p. 310] Uncertainty stimulates fear; fear stimulates "fight or flight," which pushes man into a stressful state, which prompts either aggressive behavior or departure from the system [Ref. 11:p. 310]. Uncertainty is a trigger in man and he will act in any way possible to reduce it or eliminate its existence.

Man's reactions to the uncertainty caused by change have been the major cause of many system failures [Ref. 25:p. 33]. The results of man's reactions have taken the following forms: [Ref. 25:p. 33]

1. Withholding of information, data and support.
2. Sabotage.

3. Ambivalent attitudes towards the organization and the system.
4. Lessened ego-identification with one's job.
5. Attempts to urge others to resist.
6. Lessened job effort.
7. Decisions to quit or transfer.
8. Feelings of alienation.

By understanding the causes of man's resistance to change, management should be able to develop strategies to overcome it.

A. CAUSES OF RESISTANCE TO CHANGE

At the basis of resistance to change is man's nature and five primary factors that impact on that nature. These are:

[Ref. 8:p. 347]

1. Homeostasis--man as an organism seeks an equilibrium point. Any change that influences that point causes man to take action to return to that point.
2. Habit--man gets accustomed to doing things one way. As the habit becomes ingrained it is difficult if not impossible to change it.
3. Primacy--man's first successful method of accomplishing some task is his favorite, preferred method. New methods when measured against the initial successful method are ignored even if they may be better.
4. Selective Perception and Retention--once an attitude is formed, man perceives all situations within that framework. Fixed attitudes concerning a subject cause man to reject any information that conflicts with his attitude. Man also will retain that conflicting information but is able to segregate in a manner in which it does not affect his opinion.
5. Insecurity and Regression--as mentioned in earlier chapters, man feels insecure with something new. He longs for the "good old days and ways." He fears that

he can't perform adequately. Managers fear they will become less vital and their years of training and experience less important.

Similarly, there are five factors that are external or social that also cause resistance. These five are: [Ref. 8:p. 348]

1. Conformity to Norms--group norms are forced on individuals. Customs are not to be crossed and group pressure and consensus will force individuals to return to the "established way."
2. Organizational Coherence--any attempt to change one part of an organization will affect the other parts. Change which may help one part may hurt other parts.
3. Vested Interests--any change perceived as a threat to man's economic well-being or prestige will be firmly resisted. Man has a hard time supporting any change that will result in a loss of pay or power.
4. The Sacrosanct--certain values and activities become highly resistant to change in any culture. The threat to the "old established" method will not be tolerated.
5. Rejection of Outsiders--changes when introduced by an outsider to the organization instead of by an organization member will receive firmer resistance. Strangers have always stirred man's distrust and suspicions. Man has strong identification with his own department and will resist ideas from other departments since they weren't "homegrown."

To relate the above factors to the computer industry and management, the following specific causes of resistance to computer technology can be cited:

- a. more urgent concern with getting on with "old work,"
- b. contentment with "old order" of doing things,
- c. viewing of involvement as an attempt to manipulate,
- d. not wanting to be involved with a system whose success is not guaranteed,

- e. failure of management to understand its responsibility in reducing that resistance,
- f. failure of management, particularly upper levels, to overtly demonstrate full support of the new system,
- g. inadequate or nonexistent communications--horizontally, upward or downward,
- h. fear of a loss of status,
- i. concern about changes to social relationships,
- j. concern that company interests will not be served,
- k. fears about job security, pay, promotion opportunity,
- l. lack of recognition by management when changes proposed,
- m. dissatisfaction due to changes in habitual way of performing job,
- n. resentment of repetitiveness of mundane tasks,
- o. technical problems that lead to helplessness and frustration,
- p. fear of the unknown,
- q. feelings that repetitive tasks will not allow recognition of one's abilities,
- r. inability to see end product/results of labors.

As can be seen the list seems endless, yet these are the concerns of users. These causes for resistance are man's nemesis and until they are dealt with, will continue to trouble the man trying to implement a new system and adapt to the changes of computer technology.

B. OVERCOMING RESISTANCE TO CHANGE

To successfully adapt to computer technology man must take actions to overcome the resistance to change. Lewin

saw this as a basic problem of changing man's attitudes concerning specific items of resistance [Ref. 25:p. 33]. His model to describe this situation was one in which man's attitudes reside in a central equilibrium zone. On the different sides of this zone are forces or pressures of equal forces pushing inward. If the pressures remain equal there is no motivation to change, but as the pressures to change increase on one side, the equilibrium is upset. To effect the change, the pressure from one side need be reduced, rather than increase the opposing pressure, which only causes the resistance to increase. Thus the attitude then shifts in the direction desired [Ref. 25:p. 33].

E.H. Schein expanded Lewin's theory with a Three Stage Process for effecting changes in people and organizations. These three stages are vital to effecting a change program and overcoming man's resistance [Ref. 5:p. 199]. These stages are described below:

1. UNFREEZING--alteration of forces acting on man so that his balanced equilibrium is upset enough to motivate him to make changes. Accomplished best by reducing the threats and resistances to change rather than by increasing the pressure to change.
2. MOVING--the presentation to man of the new direction and the actual learning of new attitudes.
3. REFREEZING--the acceptance of the new attitudes into the personality. The "mindsetting" of the change is firmly imbedded in man's mind.

Understanding of this theory is vital to management's ability to effectively implement system changes and effect man's successful adaptation to computers. The Unfreezing

stage is critical to overcoming man's resistance. Any system in equilibrium feels no motivation to adjust, no need to change, no momentum for change.

Since, however, change programs are almost certain to be ineffectual unless the unfreezing stage has been worked through, the systems developer must take on as part of his or her function the creation of a climate for change.

[Ref. 5:p. 200]

For the purpose of this thesis consider the system developer to be whichever person is charged with the implementation duties.

The user must have a "felt need" for change. This "felt need" can be created by an "integrating agent." This is a skilled intermediary who knows the system in great detail and has a mixture of technical, interpersonal and business experience [Ref. 5:p. 207]. He plays his role in basically four versions: [Ref. 5:p. 207]

1. As Exegetist--one who can explain the system to the user.
2. As Crusader--one who can sell the system due to their personal enthusiasm.
3. As Confidant--one who can build up user confidence and act as an advisor.
4. As Teacher--one who can provide personalized instruction.

The "change agent" (the integrating agent) is management's facilitator for change. He must be able to listen to users and be able to assess problem areas. Once the users are "unfrozen" the stage is prepared and the "moving" of the

users towards the change and new attitudes can be accomplished.

Once moved, the users will have a drive towards the new equilibrium and it must be "locked in place." The "refreezing" is the most critical stage of the implementation process [Ref. 5:p. 201]. The changes that have taken place need to be solidified and embedded in the organization to prevent backsliding to the "old way," to the old equilibrium point. Once institutionalized the organization can move ahead with confidence and a secure feeling.

C. SPECIFIC RECOMMENDATIONS TO OVERCOME RESISTANCE

Man and management must have plans when they decide to implement computers and the massive changes that accompany them. With the understanding received from the previous section, specific recommendations can be presented for management, so that successful implementation of change can occur.

Management's key concern in the implementation process should be the end-user. He is the person with final accountability. "The key to system success is total involvement of the users; trite to be sure, fundamental without a doubt." [Ref. 12:p. 23]

To overcome resistance to change, management should take the following actions: [Ref. 25:p. 33]

1. Test the water--gain sense of user group's attitudes, opinions, and feelings about old and new system. This

allows early identification and anticipation of existing resistance causes.

2. Identify opinion leaders--every effort should be made to gain their support due to their large spheres of influence.
3. Enlisting top management support--vital to success, their commitment to the new system can quell apathy and low prioritization by all.
4. Provide open communications--about the new system, reasons for the changes, possible effects, facts about the changes. Squelch the "rumor mongers." Two-way communications can alleviate fears and open the door for user involvement.
5. Having participation--user involvement allows for the internalization of the change. The users identify with the changes and therefore are personally committed to seeing it through with pride. Ego-identification takes place and the users have their own internalized motivation for accepting the plan. There follows from this commitment a drive for excellence and success with a view that failure is a reflection of themselves.
** This is critical action for every project and need be heeded by all managers.**
6. Co-opting opposition--placing a technical member in with user group to help allay fears and explain technical aspects. Must be a person with good interpersonal skills and ability to establish rapport with users.
7. Selling the idea--managers need to be positive, and actively promote strong points of the new system over the old. Once sold the project will have commitment and should be a success.

By using the above actions, management acknowledges to the user their commitment to them. This visual commitment will, itself, contribute to the success of the implementation. Although not the only actions available for overcoming resistance to change, the manager of the 80's would be on the right track if he incorporated any or all of the

above actions. People factors are the major considerations in implementing any changes to man's environment [Ref. 25:p. 35].

D. SPECIFIC RECOMMENDATIONS TO OVERCOME "TECHNOSTRESS"

To counter stress, man must recognize it. As discussed in Chapter V, the observable symptoms of stress for management are: high turnover, irritability, missed deadlines, motivation and initiative drops, increases in mistakes, equipment failure, absenteeism, decreases in morale and productivity. For the individual, the recognizable symptoms of stress have effects on the following five major areas: internal body processes, muscle tension, emotional reactions, behavior patterns and thought patterns. The signs of these symptoms are indicated below: [Ref. 26:p. 64]

1. Internal Body Processes

- a. breathing is often rapid
- b. body temperature drops while heart rate increases
- c. frequent feelings of nervousness or tiredness
- d. energy level is often visibly higher or lower than usual.

2. Muscle Tension

- a. tightening of body's musculature
- b. signs of pain or irritation in the neck, jaw or lower back
- c. general physical pains in the outer body regions
- d. headaches.

3. Emotional Reaction

- a. tone of voice reflects feelings of stress
- b. emotional reactions are expressed through facial expressions
- c. common emotions frequently associated with stress are fear, anger and sadness
- d. positive emotions, such as joy, may also indicate physiological stress.

4. Behavior Patterns

- a. changes in behavior patterns are indicators of stress (for example, changes in sleeping and eating patterns)
- b. common behavior cues are rapid or unusually slow body movements
- c. nonverbal gestures of hands and face may also reveal stress.

5. Thought Patterns

- a. excessive thought to the point of distraction from the present
- b. circular thought patterns, especially blaming self or others for problems
- c. limited thought patterns, excluding everything in life but one problem or situation.

Recognizing stress is half of the battle in defeating it. A general set of guidelines for man are that he must:

[Ref. 23:p. 92]

- 1. know the consequences of stress,
- 2. be able to identify the major stressors, their effects, and the manner in which he copes,
- 3. select those that he can do something about and take positive action to reduce, manage, and eliminate them,
- 4. develop a plan for coping and adapting which can be routinized.

More specific actions to be taken concerning the manager and his organization are as follows:

- a. Managers must be able to change their attitudes, particularly about things that seem unchangeable,
- b. Managers need to be participative and organic, not autocratic and mechanistic,
- c. Users need to feel they are part of the system and getting them involved in the planning process prior to implementation can relieve tremendous amounts of stress,
- d. Verbal communications to users and staff about changes can relieve their fears,
- e. Dispel rumors early on,
- f. Managers need to understand the personal traits of their personnel and then proceed accordingly,
- g. Management must establish a training and retraining program that will allow employees to learn new required skills,
- h. Management can establish policies of "permanent" employment; we may displace jobs with new technology but should not displace our people, find them jobs within,
- i. Management must strive to make employees feel pride in their work, good work must be acknowledged and rewarded,
- j. Management must hold the doors open for two-way communication,
- k. Management must take more care in job assignments to match skills with requirements, identify the job demands and match them with employee skills,
- l. Lay out achievable career paths,
- m. Make the job pleasurable,
- n. Utilize questionnaires, interviews and workshops to get feedback of employee views of stress and then based on that feedback, take action.

The individual and the organizational recommendations noted above are but starting points for minimization and elimination of stress. The challenge must be met, if man is to successively overcome "technostress" and adapt to the computer age in a healthy manner.

VII. CONCLUSIONS

This study is by no means the ultimate solution to man's adaptation to the age of computers. It is, however, an attempt to raise man's and management's awareness level of some of the major problems associated with computers. Only with his eyes and ears open can man expand his horizons and move forward.

Managers must realize and show genuine concern for their employees. People are by far the most important asset of any organization and should be treated accordingly. Although speed, efficiency and cost reduction are business goals, they should not be achieved at the sacrifice of personnel. The emphasis is that as the computer inevitably enters our businesses, homes and schools and presents new approaches to older problems, man has a responsibility to ensure ". . . that the transition is carried out thoughtfully with attention to the human side of the equation." [Ref. 3:p. 222]

The new technology brings along fear, resistance and anxiety. With an understanding of these areas, managers who must implement that technology should be better equipped to make man's adaptation smoother and successful. When people complain or are anxious, management must listen and investigate the causes, for only a humanistic approach will allow

". . . positive growth, and all growth--personal, corporate, or natural--depends on achieving goals through a balanced relationship with technology." [Ref. 3:p. 224]

Man's goal, concerning the computer, should be to take the technological advances and use them as tools. He cannot allow himself to become a "slave to the machine." He must preserve his independence and ability to think and feel; for only by this preservation will he be able to fully adapt and harness the powers of the computer.

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